1.0 OBJECTIVES

The Endangered Species Act (ESA) (16 USC 1531-1544), amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with USFWS and NMFS, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats.

This document is the product of an interagency consultation pursuant to Section 7(a)(2) of the ESA and implementing regulations found at 50 Code of Federal Regulations (CFR) Part 402. It consists of four actions:

- The Federal agencies that operate, or market power from, the Federal Columbia River Power System (FCRPS), namely the Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (Corps), and the U.S. Bureau of Reclamation (BOR) (collectively the "Action Agencies"), reinitiated consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to consider the effects of actions related to FCRPS configuration, operations, and maintenance on species listed as threatened or endangered under the ESA.

- BOR is also consulting on the continued operation and maintenance of 19 of its projects in the Columbia River basin (Table 1.0-1).[1] Two of those projects, the Columbia Basin Project and the Hungry Horse Project, include facilities that are also part of the FCRPS. Several of the remaining 17 BOR-owned projects in the basin include power plants and/or provide flood control benefits, but these power plants (and their associated dams and reservoirs) are not operated or coordinated as part of the FCRPS, nor do these project facilities provide system flood control. All 19 BOR projects are authorized to provide water for irrigated agriculture, and all except the Hungry Horse Project do so at present. While the configuration, operation, and maintenance of the FCRPS and the operation and maintenance of the BOR's 19 projects are separate agency actions, they are similar in that all have hydrologic effects on the flows in the mainstems of the Columbia and Snake rivers. However, this biological opinion does not attempt to apportion the

[1]Because of ongoing negotiations in a general adjudication of water rights under way in Idaho, BOR could not adequately define its proposed action to facilitate consultation for its 11 irrigation projects in the Snake River basin. Since discussions are continuing, BOR has indicated that the proposed action may be different from those measures set forth in its December 21, 1999, biological assessment. Accordingly, BOR has asked to extend the consultation on these 11 projects pending a revised proposed action and analysis of effects (see BOR 2000d). NMFS has agreed to extend the current consultation with regard to BOR's projects in the Snake River basin and to exclude those projects from this biological opinion. BOR anticipates providing the necessary additional information, and NMFS anticipates issuing a supplemental biological opinion on these projects before water from these projects is needed for irrigation use in the 2001 growing season.

Table 1.0-1. BOR irrigation projects in Columbia River basin.

Project	Location	Subbasin or Stream
Upper Columbia River (Upstream of Snake River Confluence)		
Hungry Horse	Western Montana, north of Flathead Lake	South Fork Flat Head River
Bitter Root	Western Montana, south of Missoula	Bitterroot River
Missoula Valley	Western Montana, north of Missoula	Clark Fork River
Frenchtown	Western Montana, north of Missoula	Clark Fork River
Dalton Gardens	North Idaho, north of Coeur d'Alene	Spokane (Hayden Lake)
Avondale	North Idaho, north of Coeur d'Alene	Spokane (groundwater)
Rathdrum Prairie	North Idaho, northwest of Coeur d'Alene	Spokane (groundwater)
Spokane Valley	Eastern Washington, east of Spokane	Spokane (groundwater)
Columbia Basin	Central Washington	Columbia River
Chief Joseph[1]	North-central Washington, from Canadian border to Wenatchee	Okanogan and Columbia rivers
Okanogan	North-central Washington, near Okanogan	Okanogan River
Yakima	Central Washington, near Yakima	Yakima River
Lower Columbia (Downstream of Snake River Confluence)		
Umatilla	Northeast Oregon	Umatilla and Columbia rivers
Crescent Lake Dam	Central Oregon west of Bend	Deschutes River
Crooked River	Central Oregon, north of Bend	Crooked River
Deschutes	Central Oregon, north of Bend	Deschutes River
Wapinitia	North-central Oregon, south of The Dalles	Deschutes River
The Dalles[1]	North-central Oregon, near The Dalles	Columbia River
Tualatin	Northwest Oregon, west of Portland	Tualatin River (Willamette River)
Snake River		
Minidoka	Southern Idaho and western Wyoming from Twin Falls Idaho to Jackson Lake, Wyoming	Snake River
Palisades	Eastern Idaho, on Wyoming border	Snake River
Michaud Flats	Southern Idaho, near Pocatello	Snake River
Little Wood River	South-central Idaho, north of Twin Falls	Little Wood River
Boise	Southwest Idaho, near Boise	Boise and Payette rivers
Mann Creek	Southwest Idaho, northwest of Boise	Weiser River
Owyhee	Eastern Oregon and southwest Idaho, near Ontario, Oregon	Owyhee and Snake rivers
Vale	Eastern Oregon, west of Ontario	Malheur River
Burnt River	Eastern Oregon, south of Baker City	Burnt River
Baker	Eastern Oregon, near Baker City	Powder River
Lewiston Orchards	West-central Idaho, near Lewiston	Clearwater River

Note: Shaded (Snake River) areas are not included in this biological opinion. The Arnold Project in central Oregon was also removed from this biological opinion based on comments from BOR that this is not a Federal project and was erroneously included in its biological assessment.
[1]Chief Joseph Dam and The Dalles Dam are owned and operated by the Corps, but have associated irrigation works that are owned and operated by BOR.

relative contribution of the FCRPS and BOR projects to the current status of the evolutionarily significant units (ESUs).[2]

- NMFS is also consulting internally on its issuance of a Section 10 permit for the Corps' Juvenile Fish Transportation Program (JFT). The FCRPS operation necessarily includes the JFT, which requires an enhancement permit issued by NMFS pursuant to ESA Section 10(a)(1)(A).

- NMFS is also consulting internally on its issuance of Section 10 permits for certain of the research, monitoring, and evaluation actions essential to the implementation of this biological opinion. Not all are included, because not all are sufficiently defined to identify the proposed methodologies and, from that, the estimated levels of take. As additional studies and study plans are developed in accordance with this biological opinion, NMFS anticipates the need for additional Section 10 research permits and additional review of the issuance of those permits under Section 7(a)(2).

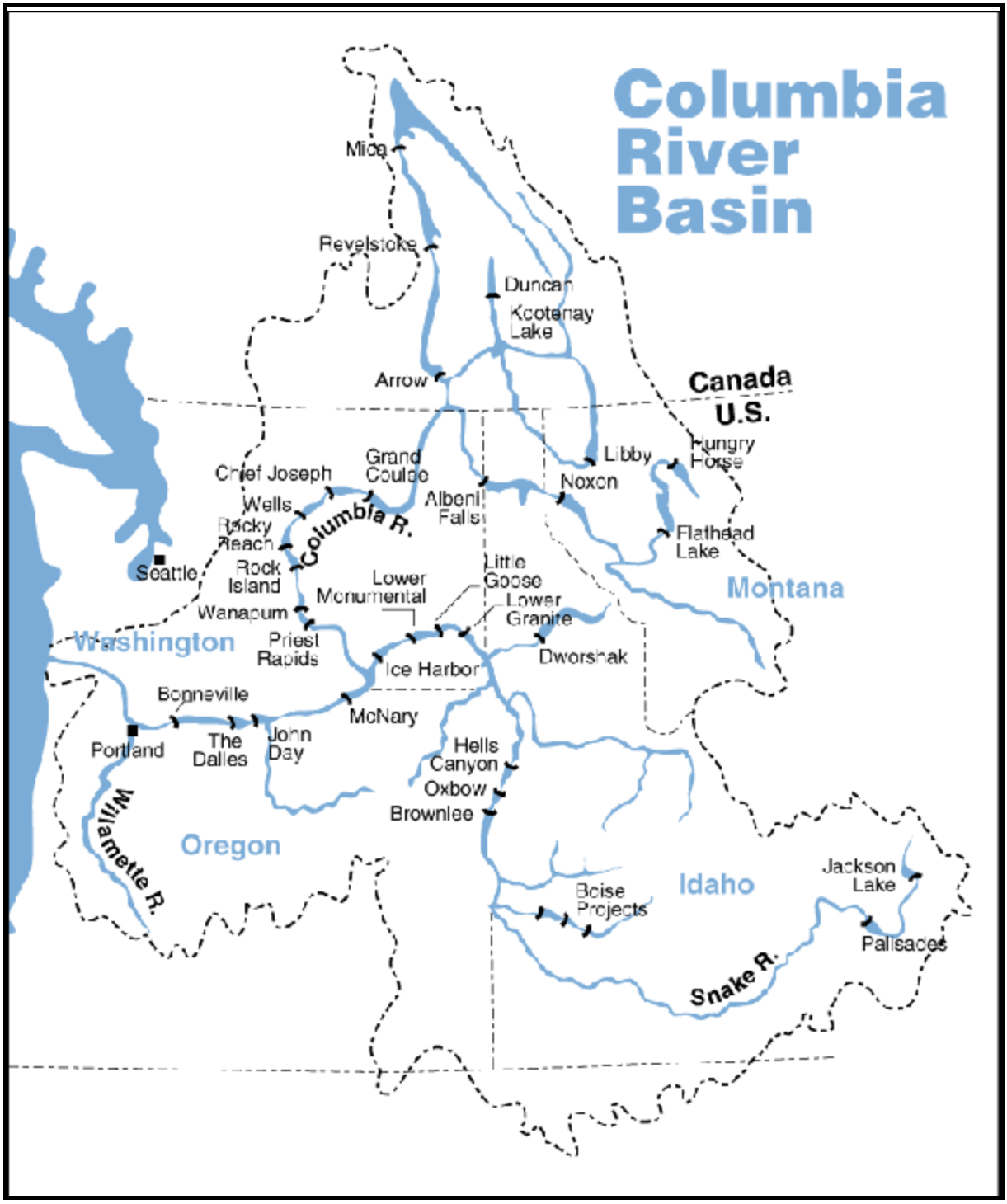
The action area encompasses the mainstem Columbia and Snake rivers from Chief Joseph Dam and Hells Canyon Dam down to and including the estuary and plume (nearshore ocean) of the Columbia River (Figure 1-1). With respect to the FCRPS projects, this biological opinion considers the effects of the existing configuration, continued operation, and maintenance of the 14 sets of dams, powerhouses, and associated reservoirs known collectively as the FCRPS and operated as a coordinated system for purposes of power production and flood control on behalf of the Federal government. The facilities that constitute the FCRPS are Dworshak, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams, powerplants, and reservoirs in the Snake River basin; Albeni Falls, Hungry Horse, Libby, Grand Coulee, Banks Lake (features of the Columbia Basin Project), and Chief Joseph dams, powerplants, and reservoirs in the upper Columbia River basin; and McNary, John Day, The Dalles, and Bonneville dams, powerplants, and reservoirs in the lower Columbia River basin. Some of these dams and reservoirs are also operated for other purposes as authorized by Congress (e.g., navigation, irrigation, fish and wildlife, and recreation). These operations are inseparable from those for power generation and flood control. They are included in the scope of this consultation, except where activities are separate Federal actions under other authorities (e.g., Clean Water Act [CWA] Section 404).

With respect to the 19 BOR projects, formal consultation on the full scope of these proposed operations is being accomplished as follows:

1. This biological opinion considers the aggregate effects of all 19 BOR projects on streamflows in the mainstem Columbia and Snake rivers (these effects result from

[2]Throughout this biological opinion, NMFS uses ESU to define anadromous salmon and steelhead populations either listed or being considered for listing under the ESA. An ESU is a population that 1) is substantially isolated reproductively from conspecific populations, and 2) represents an important component of the evolutionary legacy of the species. The term ESU may include portions or combinations of more commonly used definitions of stocks within or across regions.

Figure 1-1. Map of the Columbia River basin, including major facilities that make up the Federal Columbia River Power System.



reservoir storage and releases, diversions and withdrawals, consumptive uses, and return flows). It also considers the effects of using some of these projects and other sources to provide instream flow in the Columbia River downstream of Chief Joseph Dam. Effects considered include the frequency of attainment of the flow objectives established in the 1995 FCRPS Biological Opinion[3] and 1998 Supplemental FCRPS Biological Opinion.[4]

2. This biological opinion also considers all the known operational effects of the BOR projects upstream of Chief Joseph Dam. The only known effects of these projects on listed salmon and steelhead result from the cumulative hydrologic effects of their operations on streamflows in the Columbia River downstream of Chief Joseph Dam.

3. BOR is also consulting on any additional effects of its projects located downstream of Chief Joseph Dam in the Columbia River Basin, except for the Columbia Basin Project. BOR has already prepared biological assessments, or, as appropriate, is preparing supplemental biological assessments to address any additional effects of such projects, such as effects on tributary habitat, tributary water quality, or direct effects on salmon survival (impingement, entrainment in diversions, false attraction to return flows), through project-specific consultations designed to supplement this biological opinion. Because mainstem flows are addressed in this biological opinion, these supplemental consultations will address effects of mainstem flows only to the extent to which consultation reveals additional effects on the mainstem flow regime that are not considered in this 2000 FCRPS Biological Opinion. The schedule for these supplemental consultations is undetermined at this time pending receipt of additional information from BOR.

4. The Columbia Basin Project, features of which are located both upstream and downstream of Chief Joseph Dam, diverts water from and returns it to the mainstem Columbia River above McNary Dam (with most of the project water diverted from the Columbia River above Chief Joseph Dam, but all return flows occurring below Chief Joseph Dam). Its storage and diversion operations are integral to the operation of Grand Coulee Dam. All the project's effects on listed salmon and steelhead occur in the mainstem. For these reasons, the BOR initiated consultation specifically on the operation and maintenance of all the Federally owned lands and facilities of the project (whether such operation and maintenance is performed by BOR or by others pursuant to agreements with BOR). This 2000 FCRPS Biological Opinion, therefore, considers all the known operational effects of the Columbia Basin Project, not just its contribution to cumulative hydrologic impacts on streamflows in the Columbia River, even though some

[3]"Biological Opinion—Reinitiation of Consultation on 1994–1998 Operation of the Federal Columbia River Power System and Juvenile Transportation Program in 1995 and Future Years" (NMFS 1995a).

[4]"Supplemental Biological Opinion—Operation of the Federal Columbia River Power System Including the Smolt Monitoring Program and the Juvenile Fish Transportation Program: A Supplemental to the Biological Opinion Signed on March 2, 1995" (NMFS 1998).

of the project's features are downstream of Chief Joseph Dam in the Columbia River basin.

This consultation considers whether the effects of these actions are likely to jeopardize the continued existence of 12 listed species of Columbia Basin Project salmonids and cause the destruction or adverse modification of their designated critical habitat. The 12 species are as follows:

- Snake River (SR) spring/summer chinook salmon (*Oncorhynchus tshawytscha*; listed as threatened on April 22, 1992 [57 FR 14653]); critical habitat designated on December 28, 1993 [58 FR 68543], and revised on October 25, 1999 [64 FR 57399]

- Snake River (SR) fall chinook salmon (*O. tshawytscha*; listed as threatened on April 22, 1992 [57 FR 14653]); critical habitat designated on December 28, 1993 [58 FR 68543]

- Upper Columbia River (UCR) spring chinook salmon (*O. tshawytscha*; listed as endangered on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Willamette River (UWR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Lower Columbia River (LCR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Snake River (SR) steelhead (*O. mykiss*; listed as threatened on August 18, 1997 ([62 FR 43937]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Columbia River (UCR) steelhead (*O. mykiss*; listed as endangered on August 18, 1997 [62 FR 43937]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Middle Columbia River (MCR) steelhead (*O. mykiss*; listed as threatened on March 25, 1999 [64 FR 14517]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Willamette River (UWR) steelhead (*O. mykiss*; listed as threatened on March 25, 1999 [64 FR 14517]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Lower Columbia River (LCR) steelhead (*O. mykiss*; listed as threatened on March 19, 1998 [63 FR 13347]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Columbia River (CR) chum salmon (*O. keta*; listed as threatened on March 25, 1999 [64 FR 14508]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Snake River (SR) sockeye salmon (*O. nerka*; listed as endangered on November 20, 1991 [56 FR 58619]); critical habitat designated on December 28, 1993 [58 FR 68543]

1.1 RELATION TO OTHER BIOLOGICAL OPINIONS

This 2000 FCRPS Biological Opinion supersedes all previous opinions NMFS has issued concerning the FCRPS. This includes the 1995 FCRPS Biological Opinion and the supplemental opinions NMFS issued on May 14, 1998, December 9, 1999, and February 4, 2000. Further, NMFS and USFWS have coordinated this multispecies opinion and the opinion USFWS is issuing on the effects of hydrosystem operations on Columbia River basin species within its jurisdiction, dated December 2000. The two agencies intend the recommendations and requirements of these opinions to be mutually consistent. They represent the Federal biological resource agencies' recommendations of measures that are most likely to ensure the survival and recovery of all listed species and that are within the current authorities of the Action Agencies.

1.2 SECTION 10 PERMITS

1.2.1 Section 10 Permits for Juvenile Transportation Program

In 1999, the Corps Walla Walla District applied to NMFS for a new Section 10 permit for the JFT. As an interim measure, NMFS extended the Corps' existing Permit 895, under authority of Section 10 of the ESA and NMFS' regulations governing ESA-listed fish and wildlife permits (50 CFR Parts 217 through 227), to be valid until December 31, 2000, or until replaced by the new permit. The extension allows the duration of Permit 895 to coincide with the completion of this reinitiation of ESA Section 7 consultation on the long-term management strategy for the FCRPS. Permit 895 authorizes the Corps' annual direct takes of the following listed fish: juvenile endangered SR sockeye salmon and juvenile, threatened, naturally produced, and artificially propagated SR spring/summer chinook salmon, SR fall chinook salmon, and SR steelhead. This take is authorized for the Corps' JFT at four hydroelectric projects on the Snake and Columbia rivers (Lower Granite, Little Goose, Lower Monumental, and McNary dams). Permit 895 also authorizes the Corps' annual incidental takes of ESA-listed adult fish associated with fallbacks through the juvenile fish bypass systems at the four dams.

With regard to three other ESUs (UCR spring chinook salmon, UCR steelhead, and MCR steelhead), NMFS has determined that any take of these species associated with the Corps' transportation activities would be incidental to operation of the juvenile bypass system under the existing requirement to suspend transportation operations at McNary Dam during the spring migration period. NMFS' estimates of incidental take for each of these ESUs is described in the incidental take statement in Section 10 of this document. Any direct take of UCR spring chinook

salmon, UCR steelhead, and MCR steelhead for the purposes of the planned transport experiment from McNary Dam will be addressed in a separate ESA Section 10 permit.

In addition, Permit 895 does not cover direct take of the following lower Columbia River ESUs: UWR chinook salmon, UWR steelhead, LCR chinook salmon, LCR steelhead, and CR chum salmon. The juveniles from all of the spawning populations in these ESUs enter the Columbia River at points below McNary Dam. Thus, they are not subject to either direct or incidental take associated with the Corps' transportation program.

1.2.2 Section 10 Permits for Research and Monitoring

Scientific research and monitoring are critical parts of the overall program to minimize take of ESA-listed anadromous fish species resulting from the operation of mainstem FCRPS projects on the Columbia and Snake rivers. These activities are necessary to satisfy the Action Agencies' responsibility for minimizing take and for ensuring that jeopardy standards will be met. While some research/monitoring activities cannot be identified in enough detail at this time to allow NMFS to estimate incidental take, others can be anticipated now. Appendix H to this biological opinion provides estimates of incidental take for each of the 12 listed ESUs for the latter group of studies.

1.3 APPLICATION OF ESA SECTION 7(A)(2) STANDARDS–JEOPARDY ANALYSIS FRAMEWORK

To achieve the objectives of this biological opinion, NMFS uses the five-step approach for applying the ESA Section 7(a)(2) standards developed in the 1995 FCRPS Biological Opinion to Pacific salmon. The steps are as follows:

1. Define the biological requirements and current status of each listed species (Section 4).

2. Evaluate the relevance of the environmental baseline to the species' current status (Section 5).

3. Determine the effects of the proposed or continuing action on listed species (methods described in Section 6.1 and applied in Sections 6.2 and 6.3).

4. Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages (Section 8).

5. Identify reasonable and prudent alternatives (RPAs) to a proposed or continuing action when that action is likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat (Section 9). Thus, this step is relevant

> only when the conclusion of the previously described analysis is that the proposed action would jeopardize listed species. The RPA will have to both reduce the mortality associated with the proposed action to a level that does not jeopardize the species, and maintain (or restore) essential habitat features so that there is no adverse modification of designated critical habitat. An analysis to determine the sufficiency of the reasonable and prudent alternative will be based on the same considerations described above.

As discussed in the 1995 FCRPS Biological Opinion, the fourth step of the application framework called for a two-part analysis. The first part focuses on the action area, delineated as the geographic extent of direct and indirect effects of the action (50 CFR Section 402.02). The effects of the action, the effects of the environmental baseline, and the cumulative effects in the action area are considered together relative to the action area biological requirements of the various listed species. The essential features of critical habitat guide in this part of the analysis.

The second part of the analysis places the action area investigation in the context of the full salmon life cycle, considering each ESU's species-level biological requirements (NMFS 1995a, pp. 13-14).

> This comprehensive analysis is necessary to fully evaluate the significance of each action under consultation to the biological requirements of the listed species in all life stages. The NMFS looks beyond the particular action area for this analysis to consider measures likely to be necessary in all life stages that, in combination, would insure that the biological requirements of the listed species will be met and thereby insure its continued existence.

For the purpose of this second part of Step 4 of the ESA Section 7 framework, to assess the effects of proposed actions while listed ESUs move toward recovery, NMFS defined the degree to which species-level biological requirements must be met (NMFS 1995a, p. 14):

> At the species level, NMFS considers that the biological requirements for survival, with an adequate potential for recovery, are met when there is a high likelihood that the species' population will remain above critical escapement thresholds over a sufficiently long period of time. Additionally, the species must have a moderate to high likelihood that its population will achieve its recovery level within an adequate period of time. The particular thresholds, recovery levels, and time periods must be selected depending upon the characteristics and circumstances of each salmon species under consultation.

Pursuant to the ESA, to fully consider the current status of the listed species (50 CFR Section 402.14(g)(2)), NMFS evaluates the species-level biological requirements of a species, subspecies, or distinct population segment level. For Pacific salmonids, NMFS evaluates species-level biological requirements as they relate to ESUs. Since 1995, NMFS has developed the viable salmonid population (VSP) concept as a tool to evaluate whether the species-level requirements of ESUs are being met (McElhany et al. 2000). Each salmonid ESU may contain multiple independent populations. VSPs are independent populations that have a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over 100 years.

The attributes associated with VSPs include adequate abundance, productivity (population growth rate), population spatial scale, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle and are, therefore, distinguished from the more specific biological requirements associated with the action area (described in Section 5) and the particular action under consultation. Species-level biological requirements are influenced by *all* actions affecting the species throughout its life cycle and may be broader than the requirements of any specific independent population in the ESU. The action-area effects must be reviewed in the context of these species-level biological requirements to evaluate the potential for survival and recovery, relevant to the status of the species, given the comprehensive set of human activities and environmental conditions affecting the species.

Although the 1995 narrative standard, quoted above, defined the direct measurement of species-level biological requirements in terms of abundance, this definition also implicitly addresses the productivity criterion for VSPs. Given the current low abundance levels, the population growth rate must increase to reach the critical threshold or recovery abundance levels. In the long term, the population growth rate must remain high enough to maintain a stable return rate and keep populations at acceptable abundance levels. Although application of VSP by a technical recovery team may in the future suggest measurements of spatial scale and diversity, this biological opinion considers biological requirements primarily in terms of abundance and productivity.

For ESUs with multiple populations, the spatial scale and diversity criteria for VSPs are addressed primarily by specifying the number of populations that must meet species-level biological requirements, as defined above. This is considered on an ESU-by-ESU basis. The degree to which independent populations in an ESU have been delineated, and their relation to each other, can be relevant to an ESA Section 7 decision. Particularly important is the state of knowledge regarding the degree to which a mixture of independent populations in an ESU is required for the ESU to survive in the face of catastrophic events and long-term demographic processes and to maintain long-term evolutionary potential (McElhany et al. 2000). To the extent possible, jeopardy determinations should be based on evaluation of available information to determine if identified breeding units represent independent populations, as defined by McElhany et al. (2000). However, biological populations have not yet been defined for most ESUs considered in this opinion. In the case of the SR spring/summer chinook ESU, NMFS determined in the 1995 FCRPS Biological Opinion that the relevant measure is "at least 80% of the available 'index stocks.'" NMFS' proposed recovery plan for Snake River salmon (NMFS 1995c) also described "80% of available index stocks" as the percent required to meet specified abundance levels for delisting. For all other ESUs, all currently defined populations should be maintained to ensure adequate genetic and life history diversity, as well as the spatial distribution of populations within each ESU.

Step 4 of the application framework ultimately requires that NMFS determine whether the species-level biological requirements can be met considering the significance of the effects of the

action under consultation. Recovery planning can provide the best guidance for making this determination. The 1995 FCRPS Biological Opinion stated:

> Recovery plans for listed salmon call for measures in each life stage that are based upon the best available scientific information concerning the listed species' biological requirements for survival and recovery. As the statutory goal of the recovery plan is for the species' conservation and survival it necessarily must add these life-stage specific measures together to result in the survival of the species, at least, and its recovery and delisting at most. For this reason, the Recovery Plan is the best source for measures and requirements necessary in each life stage to meet the biological requirements of the species across its life cycle (p. 14).

Recovery planning will identify the feasible measures that are needed in each stage of the salmonid life cycle for conservation and survival within a reasonable time. Measures are feasible if they are expected both to be implemented and to result in the required biological benefit. A time period for recovery is reasonable depending on the time requirements for implementation of the measures and the confidence in the survival of the species while the plan is implemented. The plan must demonstrate the feasibility of its measures, the reasonableness of its time requirements, and how the elements are likely to achieve the conservation and survival of the listed species based on the best science available.

NMFS intends that it and the other Action Agencies will, as portions of recovery plans become final, incorporate applicable elements into their review and annual plans for the FCRPS described in this biological opinion. If the incorporation of such recovery plan elements could entail major changes in analyses or actions, the Action Agencies may reinitiate consultation with NMFS, and may need to undertake additional analyses to satisfy the National Environmental Policy Act (NEPA) and other requirements.

In 1995, NMFS relied on the proposed Snake River salmon recovery plan, issued in draft in March 1995. Since 1995, the number of listed salmonid species has gone from three to 12, and the need for recovery planning for Columbia basin salmonids has quadrupled. Rather than finalize the 1995 proposed recovery plan, NMFS has developed guidelines for basin-level, multispecies recovery planning on which individual, species-specific recovery plans can be founded. "Basin-level" encompasses habitat, harvest, hatcheries, and hydro. This recovery planning analysis is contained in the document entitled "Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy" (hereafter, the Basinwide Recovery Strategy [Federal Caucus 2000]). The Basinwide Recovery Strategy replaces the 1995 proposed recovery plan for Snake River stocks until a specific plan for those stocks is developed on the basis of the Basinwide Recovery Strategy. Recovery plans for each individually listed species will provide the particular statutorily required elements of recovery goals, criteria, management actions, and time estimates that are not developed in the Basinwide Recovery Strategy.

Until the species-specific recovery plans are developed, the Basinwide Recovery Strategy provides the best guidance for judging the significance of an individual action relative to the species-level biological requirements. In the absence of completed recovery planning, NMFS strives to ascribe the appropriate significance to actions to the extent available information allows. Where information is not available on the recovery needs of the species, either through recovery planning or otherwise, NMFS applies a conservative substitute that is likely to exceed what would be expected of an action if information were available.

1.3.1 Section 7(a)(2) Jeopardy Analysis Framework Applied to FCRPS

In this section, NMFS discusses the application of the statutory requirements of ESA Section 7(a)(2) to the actions considered in this consultation. Whereas the statutory standards, and the regulations that interpret them, are the ultimate determinants for this biological opinion, it has been necessary for NMFS to develop a methodology for applying those standards that uses the best scientific and commercial data available. These methods and the available science are best applied through reference to particular indicators of the essential elements of the Section 7(a)(2) standards, the likelihoods of survival and recovery.

1.3.1.1 Jeopardy Standard

Consistent with Step 4 of the Jeopardy Analysis Framework, discussed above, the mortality of listed salmonids in the different ESUs that can be attributed to the action must be below the following:

- A level that, when combined with mortality occurring in other life stages, results in a high likelihood of survival and a moderate to high likelihood of recovery

In the application of this standard, NMFS relies on all the best available scientific information. For some ESUs, this involves a great deal of modeling analysis, including simple determinative models of passage survival, the Cumulative Risk Initiative (CRI) analysis of population status, and the incorporation of both into analyses to assess the effects of alternative operations on survival from one generation to the next. For purposes of this analysis, NMFS determined that there was enough information to quantify species status and incremental survival changes resulting from actions affecting hydrosystem passage survival for 11 of the 12 ESUs. The estimates also took into account harvest levels and the Mid-Columbia Habitat Conservation Plan as provided for in the basinwide strategy (see Appendix A). Impacts of hydrosystem effects on spawning and rearing success, as well as hatchery and habitat actions affecting other life stages, were evaluated qualitatively for these 11 ESUs. The analysis for SR sockeye salmon was entirely qualitative. There is still substantial uncertainty in the resulting NMFS' projections of the likelihood of survival and recovery. As a result, NMFS relies on this analysis primarily to provide a standardized measure of risk against which to judge the significance of the action to the continued existence of the ESU. In the end, however, NMFS' determination of consistency with

ESA Section 7(a)(2) is qualitative, informed to the extent possible by standardized quantitative analysis.

1.3.1.2 Metrics and Criteria Useful for Assessing Jeopardy Standards for FCRPS

As noted above, NMFS has determined, for the purposes of this biological opinion, that there is enough information to quantitatively evaluate the likelihood of survival and recovery for 11 of the 12 ESUs. This section describes a number of metrics integral to that analysis.

1.3.1.2.1 Metrics Indicative of Survival. For the survival component of the jeopardy standard, a measurement of the risk of absolute extinction (no more than one fish returning over the number of years in a generation) within 100 years is relevant (McClure et al. 2000c). NMFS evaluates the status of the species relative to a standardized criterion of 5% probability of absolute extinction in assessing whether the species has a high likelihood of survival under the proposed action. A 100-year period captures both short- and long-term risk because a population that has a certain probability of extinction within a short time frame, such as 24 years, will have at least that probability of extinction in 100 years. NMFS also reviews a 24-year period for two reasons: 1) because the range of uncertainty around an estimate of the 100-year metric is quite large and 2) because there is potential to further modify the action in the near term through the adaptive management process (if monitoring and evaluation indicate a need for further action to avoid longer-term risks). Absolute extinction is used instead of a quasi-extinction level because of the unambiguous interpretation of this criterion, whereas quasi-extinction levels such as 20, 50, or 100 fish have different meanings for populations of different sizes and capacities in different river systems.

NMFS received many comments on this choice of an acceptable risk level in the July 27 draft. NMFS considers 5% sufficiently conservative, especially when compared to the 10% level used by the International Union for the Conservation of Nature and Natural Resources for its lowest risk category (IUCN 2000). NMFS also received comments on the July 27 draft, suggesting that higher extinction thresholds, ranging from 5 to 350 fish, be applied. NMFS reviewed an analysis of the sensitivity of conclusions to alternative extinction risk thresholds (USFWS 2000a). NMFS knows that risk increases as the threshold is raised, but continues to conclude that absolute extinction is the most biologically meaningful threshold. An extinction threshold of one fish is the only extinction threshold that has the same biological meaning regardless of which index stock or population is addressed.

This extinction criterion is used in preference to the survival threshold in the 1995 FCRPS Biological Opinion. A review by the Independent Scientific Advisory Board (ISAB 1999) considered the survival threshold ". . . insufficiently linked to the ESA considerations of probability of extinction. . . ." This approach was also criticized by a review panel (Bamthouse et al. 1994), which stated that, if the threshold represents a critical level, "it makes little sense to define persistence in terms of the frequency of years in which the populations are below the critical level. Presumably, even one such year is undesirable." If, on the other hand, the

threshold represents some less-critical level, the review panel described that level as necessarily arbitrary. The panel also noted difficulties in interpreting the particular thresholds that were eventually used in the 1995 FCRPS Biological Opinion relative to historical performance of those stocks. Botsford (1997) also noted shortcomings of the survival threshold approach.

1.3.1.2.2 Metrics Indicative of Recovery. The recovery metric stated in the 1995 FCRPS Biological Opinion is a relevant measure of the status of the species relative to the recovery component of the jeopardy standard. This recovery metric is defined as the likelihood that the 8-year geometric mean abundance of natural spawners in a population will be equal to or greater than an identified recovery abundance level. Recovery abundance levels have not been finally determined for any of the ESUs; however, the best available estimates of recovery abundance levels for five ESUs and certain component populations or index areas are shown in Table 1.3-1. For the ESUs for which the recovery abundance levels have not been proposed, until recovery levels are determined, NMFS will rely on a combination of the survival criterion and an alternate recovery criterion defined as the level of improvement needed in the productivity of the population to result in a median annual population growth rate (lambda) greater than 1.0 over 48 years. NMFS applies this alternative recovery metric because the recovery abundance level may not yet be specified, but it is certainly higher than the current abundance level. Therefore, at a minimum, a population must be increasing at least slightly to recover.

Ultimately, recovery goals for each ESU will be established using the criteria outlined in the VSP paper (McElhany et al. 2000). Until technical recovery teams formally apply VSP standards to determine recovery goals for all ESUs, NMFS relies on the following:

- Goals established during the quantitative analysis process for the UCR ESUs (Cooney 2000, Ford et al. 1999)

- Abundance goals established in the 1995 recovery plan for the SR spring/summer chinook and fall chinook salmon ESUs

Recovery time periods for each ESU must also be determined by recovery planning. The 1995 FCRPS Biological Opinion evaluated the likelihood of recovery within 48 years. It may be unrealistic to expect populations to return to recovery abundance levels within this time period. Both the 48-year and the 100-year probabilities are reviewed in assessing whether the species has a moderate to high likelihood of recovery under the proposed action.

Table 1.3-1. Interim proposed recovery levels for some Columbia River ESUs.

ESU/Population/Stock	Recovery Abundance Level	Notes
SR spring/summer chinook (at Ice Harbor)	31,440	Source: NMFS (1995c)
SR spring/summer chinook index stocks		
Bear Valley/Elk Creeks	911	Recovery goals for Snake River index stocks defined as 60% of pre-1971 abundance[1] (Source: NMFS 1995c)
Minam River	439	
Imnaha River	802	
Poverty Flats	866	
Johnson Creek	288	
Marsh Creek	426	
Sulphur Creek	283	
SR fall chinook (aggregate pop.)	2,500	Source: NMFS (1995c)
SR sockeye[2]	2,000	Source: NMFS (1995c)
UCR steelhead populations		
Wenatchee River	2,500	Source: draft report on population structure and biological requirements of UCR steelhead and spring chinook salmon (Ford et al. 1999)
Methow River	2,500	
Entiat River	500	
UCR spring chinook populations		
Wenatchee River	3,750	Source: Ford et al. (1999)
Methow River	2,000	
Entiat River	500	

Note: Recovery abundance levels refer to naturally spawning adults.
[1]Pre-1971 abundance for index stocks from ODFW (Tinus 2000).
[2]SR sockeye salmon in Redfish Lake and two other lakes in the Snake River basin.

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